THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[FOURTH SERIES.]

No. 27. MARCH 1870.

XVI.—*On the Myology of the Wombat* (Phascolomys wombata) *and the Tasmanian Devil* (Sarcophilus ursinus). By Alexander Macalister, Professor of Zoology and Director of the Museum, University of Dublin *.

Through the kindness of Professor Haughton, I have recently had the opportunity of making, with his assistance, a careful dissection of the two above-named marsupials. They were both salted specimens, but in excellent preservation. The Wombat was 33 inches long, and was an adult female full-grown; it had a young one in its pouch surrounded by shreds of a membrane, but of what nature could not be ascertained. The embryo was 1 inch and 2 lines in length.

The Tasmanian Devil was about 27 inches long and in good condition; it was also a female, but not fully grown, the hinder molar teeth were not cut. The muscles of the wombat were firm and red; those of the native Devil were softer and paler, but still distinct. The dense pig-like skin of the Wombat was with difficulty taken off, as the subjacent tissue was dense and firm. The platysma and panniculus carnosus in both are weak and undefined.

The trapezius of the Wombat arises from the occipital ridge, from the cervical spines and ligamentum nuchæ, and from the seven upper dorsal spines; it stretches as an undivided muscular sheet to the spine of the scapula and the acromion process. The anterior fibres were not attached to the clavicle, but, gliding over it, replaced the clavicular deltoid, and were inserted into the deltoid crest of the humerus, overlying the great pectoral. There was no tendinous intersection over the line of the clavicle, although such a line often exists when

* Communicated by the Author, having been read before the Royal Zoological Society of Ireland.

this muscle misses the clavicle—for instance, in *Manis Dalmannii*, in which the arrangement is similar, but the muscle is crossed by an inscription at the line of the clavicle (Humphry); this is interesting, as *Manis* is a fossorial animal like the Wombat. In the Civet (*Viverra civetta*) this same arrangement exists, and an inscription is present (Devis); and in the Agouti and Guinea-pig, Dog, Dingo, Badger, Lion, and many other animals a tendinous line marks the junction. In the Rhinoceros there is no tendinous inscription, nor in the Llama. Prof. Owen describes the anterior fibres of this muscle in *Perameles* as continued into the pectoralis major, which I suppose is a similar arrangement. The trapezius in *Sarcophilus* arises from the occipital crest and nuchal ligament and from the upper nine or ten dorsal vertebræ; it is inserted into the scapular spine, the upper border of the acromion, and to the outer fourth of the clavicle. The part of the muscle corresponding to the root of the spine of the scapula was weak and tendinous, and nearly divided the fleshy part into an upper and lower trapezius; however, a thin muscular margin near the spines of the vertebræ saved it from this division. In *Macropus giganteus* it arises from the ligamentum nuchæ and from the three lower cervical and six upper dorsal spines. It is situated similarly in Bennett's Kangaroo. In the Opossum and Phalanger its occipital origin is much larger, and it extends downwards along all the dorsal spines. The insertion in all is constant into the outer half of the clavicle, the acromion process, and the whole spine of the scapula; and in the Opossum it is attached to the upper part of the vertebral edge of the scapula, as well as to the spine.

Beneath the trapezius, the omo-atlantic stretches, in the Wombat, from the atlas and axis to the outer half of the scapular spine, and into the upper margin of the acromion process. In *Sarcophilus* its attachments were from the transverse process of the atlas and to the outer half of the spine of the scapula, and into the upper edge of the acromion process. In the Wallaby it arises from the three upper cervical vertebræ, and is inserted into the anterior fourth of the scapular spine and into the whole length of the clavicle. In the Giant Kangaroo it is attached to the transverse process of the atlas and axis, and is inserted as in the Wallaby. In the Opossum it arises from the atlas alone, and is inserted into the anterior fifth of the spine of the scapula. (For an account of the synonyms of this muscle, see the anatomy of *Bradypus tridactylus*, Ann. Nat. Hist. 1869, vol. iv. p. 52.)

The rhomboideus is composed of three parts, but they are not separable in the Wombat; it arises from the upper four or

five dorsal spines, from all the cervical, and from the occipital bone below the last; it is inserted into the entire length of the vertebral margin of the scapula. In *Sarcophilus* its attachments are similar, but it is distinctly divisible into a rhomboideus occipitalis (Murie and Mivart, occipito-scapularis of Wood) and a proper rhomboid made up of the fused major and minor. In both it is a thick muscle. It is faintly divisible in the Opossum (Meckel says, not) and Phalanger as in the native Devil, but less in the *Macropus giganteus* and Bennett's Kangaroo: in these the muscle only extends to the three upper dorsal spines; in the Opossum and Phalanger, on the other hand, it extends down to the fifth and sixth dorsal spines.

Serratus posticus, in the Wombat, is a large muscle arising tendinous from the whole series of dorsal spines except the last, and is inserted fleshy into all the ribs, forming a continuous sheet, as in the Pig. In *Sarcophilus* the serratus passes from the upper half of the dorsal spines, and is inserted into the upper eight ribs.

Serratus magnus, in the Wombat, is divided into two parts, the upper of which includes the levator scapulæ; this portion is very weak, and its attachments are, as usual, from the lower four cervical vertebræ and from the upper three ribs to the upper part of the scapular spine. The lower part arises from all the ribs from the fifth to the eleventh inclusive (there are fifteen ribs, as described by Waterhouse, 'Marsupialia,' p. 280), and is inserted into the inferior angle of the scapula, at the subscapular side, and into a small part of the axillary margin. In *Sarcophilus* its attachments are similar, and the levator scapulæ is inseparable. In *Macropus giganteus* and the Wallaby it arises from the transverse processes and ribs from the third cervical to the sixth dorsal vertebræ continuously. In the Opossum the levator scapulæ arises from the transverse processes of all the cervical vertebræ but the atlas, and is nearly inseparable from the serratus proper, which extends from the first to the eighth ribs (Meckel describes them as separate); and the muscles are similarly arranged in *Phalangista*.

The splenius in the Wombat is a continuous sheet, and not easily divided into the two parts, capitis and colli; it arises from the spines of the vertebræ forming the upper fifth of the dorsal region and from all those of the cervical vertebræ below the axis; the fibres are inserted into the occipital bone and into the posterior aspect of the upper cervical transverse processes. In *Sarcophilus* the splenius passes from the four upper dorsal and six lower cervical spines to the transverse process of the atlas and the occipital bone.

The complexus is very large in the Wombat, and is attached to the transverse processes of all the cervical vertebræ and the upper five dorsal vertebræ; its insertion is into the occipital bone, as usual, on each side of the mesial line. In *Sarcophilus* it is very large, and is intersected by several inscriptions. In the *Macropus giganteus*, the Phalanger, and Opossum, as well as in the Wallaby, it is similar in arrangement.

The semispinalis colli, the ilio-costalis dorsalis, and colli, the recti capitis postici major and minor, the obliqui capitis, are all normal in all, the first three merely varying slightly in the number of their vertebral attachments. The intercostals, the levatores costarum, interspinales, intertransversales, longissimus dorsi, and trachelo-mastoid are all normal, and in none of the marsupials presented any features of interest.

The latissimus dorsi of the Wombat arises from the lower six ribs, from the spinous processes of the lower eleven dorsal vertebræ, and from the lumbar aponeurosis. It has no connexion with the angle of the scapula, and is inserted in front of the teres major, and slightly connected with it, into the usual situation on the humerus. This muscle sends off the dorsi epitrochlear muscle, or omo-anconeus of Prof. Owen, which, arising directly from the tendon of the latissimus dorsi, is inserted into the inner side of the olecranon process. In *Perameles*, Professor Owen describes this muscle as having an accessory origin from the inferior angle of the scapula. In *Sarcophilus* its attachments are the same, and the dorsi epitrochlear muscle is as in the Wombat. In the Opossum it arises from the seventh to the thirteenth dorsal vertebræ, and from the lumbar vertebræ, by a fascia, and, as remarked by Meckel, from none of the ribs; it is inserted into the usual ridge on the humerus. In the Phalanger the muscle similarly detaches a dorsi epitrochlear muscle; and the parts are similar in the Wallaby and the Giant Kangaroo.

The pectoralis major in the Wombat arises from the sternum, from the sternal half of the clavicle, and from the upper six ribs, and is inserted into the pectoral ridge of the humerus; a separate portion exists underneath, which extends from the manubrium sterni and from the cartilage of the first rib to the head of the humerus, on a level above the last: these two portions are quite separate from each other; but I think they are only separate factors of the great pectoral. A similar band I found in the Badger, in which a fasciculus beneath the great pectoral passed from the top of the sternum to the greater tuberosity of the humerus: this seems to correspond to the third portion of the great pectoral in the Hare, Rabbit, Guinea-pig, and Agouti. In *Sarcophilus* the muscle passes from the clavicle, sternum,

and upper five ribs to the pectoral ridge of the humerus, and is undivided. The muscle is large and single likewise in the Giant Kangaroo (Meckel describes it as bilaminar) and in Bennett's Kangaroo. The Opossum and Phalanger displayed no sign of segmentation.

The pectoralis minor of the Wombat is a small thin muscle which lies beneath the last named and inferior to the second slip of the greater pectoral just referred to; it arises from the mesosternum, and is inserted into the outer part of the greater tuberosity of the humerus, the coraco-humeral ligament, and into the coracoid process. In *Sarcophilus* it is attached to the head of the humerus and the shoulder-capsule, and, more slightly than in the Wombat, to the coracoid process; and in this animal its origin is from the abdominal linea alba, lower ribs, and mesosternum. This muscle is joined to the greater pectoral as a deep inseparable lamina in the Giant Kangaroo and in *Macropus Bennettii*, or absent, according to Meckel and Prof. Haughton (Proc. R. I. A. 1866, p. 81). In the Phalanger and Opossum it is present and passes to the humeral head below the shoulder-capsule; it is similarly situated in the Bandicoot.

The subclavius muscle exists under the form of a sterno-scapular band, arising fleshy from the first rib, and passing beneath the clavicle to be inserted into its outer sixth, into the upper border of the acromion process, and into the entire length of the upper margin of the scapular spine. This muscle did not resemble the arrangement described by Prof. Rolleston (Trans. Linn. Soc. vol. xxvi. p. 626). In the Wombat examined by him the muscle arose thick and fleshy from the first rib, and was inserted into the outer end of the clavicle and, by means of the fascia covering the supra-spinatus muscle, into the whole length of the spine of the scapula; before its insertion it was joined by a fine tendon from a delicate muscular belly arising from the sixth costal cartilage, and homologous with the muscular fasciculus in the crocodile which runs from the second sterno-costal cartilage to the sternum, in series with the external oblique and outer intercostals. As I was acquainted with Prof. Rolleston's description, when dissecting the animal I looked most carefully for this curious arrangement, but was disappointed; for I saw no sign of any prolongation from below attached to the subclavius. The insertion of the rectus abdominis was clear and tendinous into the first rib; and the only other muscle whose fibres could have run into it from below was the rectus thoracis (*vide infrà*); but there was no sign of any fusion in our specimen. Professor Rolleston's specimen seems to have been

a better-developed individual; but this union does not seem to be the invariable rule in *Phascolomys*. A union of the origin of the subclavius with the insertion of the rectus abdominis occurs in *Orycteropus* *; and in this animal also the muscle is a true sterno-scapularis, as also in the Porcupine. A sterno-scapular band exists in the Llama, Rhinoceros, Hippopotamus, Axis, and other non-claviculate mammals; but it is interesting, as bearing on the homologies of this muscle, that, except in a few rare cases as a human anomaly, it never coexists with the ordinary subclavius.

In *Sarcophilus* the subclavius passes from the first rib-cartilage to the clavicle, but is not traceable further. In the Virginian Opossum it runs from the first sterno-costal cartilage to the outer third of the clavicle and the acromion process. In the Phalanger its insertion is still more extensive, and in *Macropus giganteus* and *Bennettii* its insertion extends for the outer two-thirds of the clavicle. In none of these latter is its sterno-scapular continuation marked. From the considerations given above, I think we can scarcely regard the sterno-scapular as any thing but a variety of the subclavius.

The rectus thoracicus arises from the lower part of the sternum, as far as the summit of the mesosternum, by a thin aponeurosis, which becomes fleshy and is inserted into the second and third ribs external to their cartilages; no fibres arise from the sixth rib, nor are any inserted into the first. In *Sarcophilus* the insertion is prolonged into the four upper ribs from the sternum. This is the muscle which is considered by Professor Rolleston (and, I think, with some reason) serially continuous with the external oblique. I have called it rectus thoracicus temporarily, for want of a better name; but it is evidently not the same as the more superficial rectus thoracis of Turner.

The pectoralis quartus in the Wombat and *Sarcophilus* covers the side of the chest below the fifth rib, and is inserted into the pectoral ridge of the humerus. In the Kangaroo and Wallaby this muscle is very large and superficial, its lowest fibres blending with those of the panniculus carnosus, its hinder fibres with those of the latissimus dorsi, and its anterior ones with those of the great pectoral. It is smaller and more definite in the Phalanger, and most distinct and separate in the Opossum. (For an account of the synonyms of this muscle, see the Anatomy of *Bradypus tridactylus*, Ann. Nat. Hist. July 1869.) Professor Owen regards this muscle as a differentiated portion of the great pectoral; and Prof. Humphry, who has added another new name to the eight by which this

* Galton, Trans. Linn. Soc. vol. xxvi. p. 572.

muscle is known (calling it brachio-lateralis), regards it as an intermediate piece of the great superficial external muscular sheet between the pectoralis major and the latissimus dorsi—a conclusion which, I think, is warranted from its position. It is most powerfully developed in swimming animals, such as the seal and the otter, in which its action is very definite and important.

There was no lateral rectus thoracicus in any of the marsupials which I have dissected. The transversi thoracis, anterior and posterior, are weakly developed in *Sarcophilus*; the latter is distinct, though small, in the Wombat; and the former is present and well marked in *Macropus giganteus* and *Bennettii*.

The deltoid of the Wombat is divided into two parts: one of these (the clavicular) has been mentioned already in connexion with the trapezius. The scapular deltoid arises from the acromion process and scapular spine, and is attached to the deltoid crest on the humerus separate from the preceding; this crest is prominently marked, although the deltoid is not very large.

In the Tasmanian Devil the acromial deltoid is separate from the scapular, and the latter is a long narrow muscular band. There is no clavicular deltoid separate from the outer fibres of the acromial portion. An undivided clavicular and scapular deltoid occurs in the Giant Kangaroo and in *Macropus Bennettii*, more extensive in origin in the former than in the latter. It is similarly attached in the Phalanger and Virginian Opossum. In *Perameles* Professor Owen describes an accessory slip arising from the middle of the inferior costa of the scapula below the infraspinatus, and inserted into the upper part of the deltoid-crest of the humerus. I did not see this interesting aberrant accessory fasciculus in any of the other marsupials examined.

The supraspinatus is larger than the infraspinatus in the Wombat, the Phalanger, *Perameles*, *Sarcophilus*, and the Opossum; in the Giant Kangaroo they are about equal, while in Bennett's Kangaroo the infraspinatus is the larger. There are no points of importance relative to these muscles; they are attached to the capsule of the shoulder, but none of these capsular muscles perforate it. The supraspinatus is often larger in other animals than the infraspinatus, as in the Lion, Agouti, Guinea-pig, Rabbit, Hare, Rat, Llama, &c.

The teres minor is not distinct from the infraspinatus in the Wombat or *Sarcophilus*, but a distinct fascial band takes its place; in the Wallaby it is present and separate; but in *Macropus giganteus*, *Phalangista vulpina*, *Perameles lagotis*,

and *Didelphys virginiana* it is not at all separable from the infraspinatus.

The subscapularis presents no feature of interest in the Wombat; its two series of fibres are blended very perfectly. In *Sarcophilus* it is small, and scarcely covers two-thirds of the subscapular fossa. It is large in the Giant Kangaroo, proportionally still larger in Bennett's Kangaroo, and moderate in the Phalanger, Opossum, and Bandicoot. There is no subscapulo-humeral muscle in any of these marsupials separate from the subscapularis proper.

The teres major is large in the Wombat, and is attached to the lower half of the axillary costa of the scapula; some fibres of the inner head of the triceps are continuous with its fibres of insertion. It is also well developed in the native "Devil," much smaller in the Opossum, Phalanger, *Macropus giganteus* and *Bennettii*.

The coraco-brachialis is extremely small and rudimentary in the Wombat, consisting of a fleshy fascicle inserted immediately below the inner tuberosity of the humerus; it is closely applied to the subscapularis and capsule of the shoulder; and its origin, which is tendinous, is at first united to the tendon of the biceps. In *Sarcophilus* it arises by a tendinous flat band from the tip of the coracoid process, and is inserted into the neck of the humerus above the latissimus dorsi tendon; it is also closely applied to the surface of the subscapularis. In *Macropus giganteus* its origin is from the anterior border of the small coracoid process, in a line continuous forwards from the origin of the omo-hyoid; its insertion is similar to that above described, and is continuous with the upper fibres of the triceps internus. In *Macropus ruficollis* it is divided into two fascicles; but both these represent the short muscle of Mr. Wood. It is similar in its nature, but is small, short, and tendinous for two-thirds of its length, in the Opossum and Phalanger.

The biceps in all the marsupials is a double muscle; and the division is easily seen, either in the origin or in the insertion, in all the instances which have come under my notice. In the Wombat the muscle has two distinct tendons of origin, one coracoidal and one glenoidal; from these, two bellies descend the arm, slightly fused but capable of easy separation upon tearing; the fibres of the coracoidal origin pass to be inserted into the radius at its tubercle, those of the glenoidal portion seek an ulnar insertion in front of the insertion of the brachialis anticus. In *Sarcophilus* two tendons of origin exist, united, however, by a thin membranous expansion; but on dividing this and gently pulling asunder the two main ten-

dons, a division into coraco-radial and gleno-ulnar portions can be made without difficulty. In *Macropus giganteus* the portions are distinct, and the gleno-ulnar muscle unites at its insertion, as described by Prof. Owen, with the brachialis anticus; the same occurs in *Macropus Bennettii*, in the Phalanger, and in the Opossum, in all of which the coraco-radial muscle is nearly double the size of the gleno-ulnar. Mr. Galton mentions that one individual of *Macropus Bennettii* had only a single head to its biceps; but this is, I think, an individual variety, as the four individuals of this group dissected in Dublin had two heads: but even in this case the duality of the muscle is shown by its double (radial and ulnar) insertion. Meckel describes the insertion of the gleno-ulnar muscle as separate from that of the brachialis anticus. In the specimen which I examined they were scarcely separable. The connexion between the tendons in *Sarcophilus* might at first sight have led to their having been considered but one head; however, a closer examination at once decided the duality of the origin. This union is interesting as bearing upon the important point suggested by Prof. Humphry, that, as the portion of the glenoid cavity from which the long head of the biceps arises is in reality coracoidal, so both heads of this muscle are truly coracoidean in their origin. Professor Owen (Anatomy of Vertebrates, vol. iii. p. 12) states that in *Perameles* the coracoidal head is suppressed, and also that the fleshy belly is inserted along with the brachialis internus into the ulna, while another portion seeks the radius—thus showing that, while the origin is single, the muscle in reality is double. Meckel only found one head for this muscle in *Macropus giganteus*.

The brachialis anticus in the Wombat was as usual in its position and attachments, winding round the bone below and external to the deltoid-crest, lying in a deeply excavated sulcus in the humerus; its insertion is behind the attachment of the gleno-ulnar muscle, and quite separate from it. Its position is similar in *Sarcophilus*, the Bandicoot, Opossum, Phalanger, Bennett's and Giant Kangaroo.

The triceps longus is large, and occupies more than a third of the axillary margin of the scapula. It is equally well developed in the Tasmanian Devil, the Wallaby, the Giant Kangaroo, the Opossum, Bandicoot, and Phalanger.

The lateral heads are united into one large humeral muscle, inseparable from each other, and with the usual course and attachments, in all the marsupials. The dorsi epitrochlear in all is quite separate from the true triceps, and seeks its usual insertion into the inner side of the olecranon. The relation of

this dorsi epitrochlear to the sartorius I have elsewhere suggested; and in the light of the modification of the last-named muscle in the sloth (Ann. & Mag. Nat. Hist. July 1869), in which the origin of the muscle is tendinous from Poupart's ligament, and not from the bone, the homology is still more striking.

A subanconeus, from the lower sixth of the humerus to the synovial membrane of the elbow-joint, is present in the Tasmanian Devil; but I have not found it in any of the others.

The pronator radii teres in the Wombat is well developed, and passes from the inner condyle to the lower half of the radius. In *Sarcophilus* it is smaller, and is attached to the middle third of the radius. In the Opossum and Phalanger it resembles the last in disposition; but in *Macropus giganteus* and *Bennettii* it is inserted into the upper third of the radius. No coronoid slip was present in any of these marsupials.

The pronator quadratus was very weak in the Wombat, and occupied the lower third of the forearm. In *Sarcophilus* it extends for one-half, but is very thin, and occupies very little of the surfaces of the radius and ulna, merely lying in the space intervening between the bones. In *Macropus Bennettii* and *giganteus* it extends for rather more than the lower four-fifths of the interosseous space; it is similar in the Opossum as well as in the Phalanger and *Perameles*.

The flexor carpi radialis in the Wombat passes from the inner condyle to the second metacarpal bone. In *Sarcophilus* it sends an additional slip to the trapezium. In *M. Bennettii* it is inserted into the same bone or into the metacarpal bone of the thumb according to Prof. Haughton (P. R. I. A. 1866, p. 83). Its attachments are similar to those in the Wombat, in the Phalanger, Opossum, and Bandicoot.

The palmaris longus in the Wombat arises as usual, and is inserted by a flat tendon into the palmar fascia; it is present and similarly arranged in *Perameles lagotis*, *Macropus giganteus* and *Bennettii*. The palmaris accessorius, the commonest anomaly of this muscle in human anatomy, exists along with the true palmaris longus in the Wombat; and, like a very common human variety of the muscle (figured in the 'Proceedings of the Royal Irish Academy,' vol. ix. pl. 8. fig. 2), it arises by a flat tendon from the inner condyle; this soon becomes fleshy, and ends in a tendon which, passing through a special groove in the annular ligament, is inserted into the pad in the palm of the hand. This is the variety of the muscle existing in *Sarcophilus*, the Opossum, and Phalanger.

The flexor carpi ulnaris in the Wombat arises by two heads

—one from the internal condyle, and one from the olecranon process; this muscle is inserted into the fifth metacarpal bone. In *Sarcophilus* it is also bicipital, and is inserted into the pisiform bone, sending a slip (ulnaris quinti digiti) to the first phalanx of the little digit. This muscle is very large in the Opossum and Phalanger; it has no condylar origin in the Great Kangaroo and Wallaby.

The flexor sublimis digitorum arises in the Wombat from the inner condyle, inseparable from the profundus; but its tendons are small and separate, and lie on the surface of the deep flexor tendons; they pass to the fingers, and are perforated by the deep flexor; they terminate in the digital aponeuroses at the base of the first phalanges. In *Sarcophilus* there are three portions in the flexor muscle, and the superficial of these is the flexor sublimis; the tendons of the sublimis are arranged exactly as in the Wombat. In the Wallaby the sublimis arises from the inner condyle inseparably united to the profundus; but from the tendon of the common flexor above the wrist the fleshy fibres of the sublimis arise and form a lower belly, which sends tendons to all the fingers but the first. This arrangement can be understood in the light of the digastric modification of the flexor sublimis found in *Loris* and described as an anomaly in human anatomy. The muscle is quite distinct in the Opossum, and has perforated tendons.

The flexor profundus and flexor pollicis longus are more or less united in all. They are comparatively separate at their origin in *Sarcophilus*, but indivisible in the Wombat and Wallaby. The tendons in all are five, and pass to the five toes.

The supinator longus is rudimentary in *Sarcophilus*, and is represented by a band of superficial muscular fibres arising from the fascia over the deltoid muscle, and very slightly from the supinator-ridge of the humerus inserted into the fascia over the thumb. In the Wombat it is also superficial and thin, fascial in origin mainly and in insertion exclusively. In the *Macropus Bennettii* it is larger, and has a bony insertion into the metacarpal bone of the pollex. In the Giant Kangaroo it is purely bony in attachments, and is inserted into the trapezium and pollex. In the Opossum and Phalanger it is inserted into the trapezium and external lateral ligament of the wrist.

The extensor carpi radialis is a single muscle in *Macropus Bennettii*, the Wombat, *Sarcophilus*, Phalanger, and Giant Kangaroo, and is inserted into the bones of the second and third metacarpals. In the Opossum it has a single tendon only.

This possibly may be the muscle described by Professor Owen in *Perameles* as supinator longus, which "is inserted by one of its divisions into the base of one of the metacarpal bones of the index finger, and by the other into the adjoining metacarpal bone," as this is similar to the arrangement of the extensor carpi radialis in *M. Bennettii*, to which a separate supinator is superadded.

The extensor digitorum communis arises from the outer condyle, and is inserted into the second, third, fourth, and fifth toes in the Wombat, *Sarcophilus*, Opossum, *Phalangista*, Wallaby, and Giant Kangaroo.

The extensor digitorum secundus (extensor minimi digiti of anthropotomy) is normal in origin and supplies tendons to the fourth and fifth toes in the Wombat, to the third, fourth, and fifth in *Sarcophilus* (and of these the latter two are double), to the third, fourth, and fifth in Bennett's and the Giant Kangaroo, to the fourth and fifth in the Opossum and Phalanger.

The extensor carpi ulnaris has a double origin, from the ulna and outer condyle, and is inserted into the fifth metacarpal, in the Wombat; it has no ulnar origin in the Tasmanian Devil, Opossum, or Phalanger, but has one in Bennett's and the Giant Kangaroos, as well as in *Perameles*.

The anconeus externus of the Wombat is distinct and fan-shaped, and separate from the triceps. In the Devil it is united to the triceps, and extends down from the upper fifth of the ulna. It is distinct in the Opossum, Phalanger, Giant Kangaroo, and *Macropus Bennettii*.

The anconeus internus is round and more distinct than the externus in all the marsupials, and, in all, crosses over the ulnar nerve. This muscle is even more distinct in the majority of animals than the last.

The extensor ossis metacarpi pollicis is large in all, and runs from the whole of the back of the ulna and interosseous membrane to the trapezium and metacarpal bone of the thumb; it crosses the extensor carpi radialis tendon; and in the Opossum and Phalanger it extends over the supinator longus tendon also.

The extensor primi internodii is absent in all. The extensor secundi internodii in *Sarcophilus* and the Wombat passes from the lower third of the ulna to the last phalanx of the pollex; it is present and similar in all the other marsupials, and also in the Monotremes *Echidna hystrix* and *Ornithorhynchus paradoxus*, in both of which the extensor ossis metacarpi pollicis and primi internodii pollicis are both absent.

The extensor indicis is absent in the Wombat, but in

*Sarcophilus* extends from the lower end of the ulna to the index, middle, and ring fingers, completing thus the third group of extensors for the digits. A small slip passes from it to the thumb, similar to the extensor pollicis et indicis of the Dog.

The supinator brevis occupies the upper two-thirds of the radius in the Wombat, the upper third in *Sarcophilus*, the Wallaby and Giant Kangaroo, and the upper fourth in the Opossum; in all it has a condylar origin. In none of these does its insertion reach to such an extent as in *Echidna hystrix*, in which it occupies the entire length of the radius, and balances the pronator radii teres.

The abductor pollicis is very small in *Phascolomys*, is moderate in size in *Sarcophilus*, but, as a rule, small in the other marsupials, except in the Opossum—in which all the thumb-muscles are particularly well developed, an opponens pollicis being present in it, although suppressed in all the other marsupials which I have dissected.

The palmaris brevis in the Wombat is absent; but in the Tasmanian Devil a slip representing it arises from the pisiform bone, and is lost over the tendons of the flexor muscle of the digits. In no animal have I seen this muscle so curiously displaced as in *Echidna hystrix*; for in a fine specimen of this animal dissected by Professor Haughton and myself, December 29, 1869, this muscle, or a small one like it, arose from the ulna for a quarter of an inch above its lower end, and was lost in the fascia over the tendons of the wrist.

The lumbricales are four in number in the Wombat and *Sarcophilus*, one passing from the flexor tendon to the polliceal side of each digit; they are similarly arranged in *Phalangista*, *Perameles*, and *Didelphys*.

The palmar interossei in the Wombat and *Sarcophilus* are four in number:—the first, or Henle's interosseus primus volaris; the second, to the ulnar side of the index; the third, to the radial side of the annularis; the fourth, to the radial side of the little finger. The dorsal interossei are five in number:—first, abductor of the index, from the first and second metacarpal to the first phalanx of the index; second, from the second and third metacarpals to the middle finger; third, from the third and fourth to the middle finger; fourth, from the fourth metacarpal to the ring-finger; and fifth, from the fifth metacarpal to the little finger; this last is extremely small in the Wombat—indeed, reduced to an excessively delicate thread.

The external oblique arises, in the Wombat, *Macropus*, and *Phalangista*, from the eight lower ribs and lumbar fascia, and, passing inward, is inserted into the border of the ilium, into

the outer border of the marsupial bone, and into the linea alba. From the iliac spine to the root of the marsupial bone there runs in the lower border of this muscle a tendinous band, at which the femoral fascia lata splits, and which arches over the femoral vessels: this evidently is the true Poupart's ligament. A similar arrangement exists in *Sarcophilus*; the external abdominal ring intervenes between the Poupart's ligament and the marsupial bone.

The pyramidalis arises from the inside of the marsupial bone, and is inserted into the median line for a considerable extent. The rectus in *Sarcophilus* and the Wombat arises from the pubis inside the marsupial bone, and is inserted into the cartilage of the first rib, but was not connected to the subclavius. In *Sarcophilus* it extends up to the summit of the sternum; its inscriptions are clear and distinct.

The transversalis and internal oblique muscles are normal in every respect.

The quadratus lumborum is a wide triangular muscle in the Wombat, arising from the posterior third of the iliac crest and from the ilio-lumbar ligament, and is inserted into the transverse processes of the lumbar vertebræ and, by a few fibres, into the last rib. A small portion of it springs from the upper transverse processes and passes also to the last rib.

The gluteus maximus in the Wombat is united to the agitator caudæ, and arises from the posterior margin of the crest of the ilium and lumbar fascia, and is inserted into the outer and back part of the great trochanter. In *Sarcophilus* its course is similar, but it is separate from the agitator caudæ and lies beneath it. In *Macropus Bennettii* it is divided into two—one anterior, from the front of the iliac crest, and one posterior, from its usual site of origin: they are with difficulty separable; but the anterior is properly the tensor vaginæ femoris. The same separation is present in the Giant Kangaroo; and the posterior border is with difficulty separable from the agitator caudæ: they are still more closely fused in the *Phalangista vulpina* and also in *Didelphys virginiana*.

The gluteus medius is with difficulty separated from the gluteus minimus, and is very large in the Wombat; it is smaller in *Sarcophilus*, and in both displays nothing unusual in its attachments: they are quite separable in *Macropus giganteus* and *ruficollis*, also in the Opossum, Phalanger, and *Perameles*.

The agitator caudæ is separate from the external gluteus in *Sarcophilus*, and arises from the posterior border of the crest of the ilium by a very few fibres, also from the sacrum and three anterior caudal vertebræ; passing superficial to the

gluteus medius, it is inserted into the femur at the posterior and external part of the great trochanter. In *Macropus Bennettii* it arises from the upper three caudal vertebræ, and is closely united to the gluteus maximus. In the Giant Kangaroo, *Phalangista*, and *Didelphys* it is similar, but less easily separated from the gluteus maximus.

The gluteus minimus is hardly separable from the medius in *Sarcophilus*, less so in the Wombat, but quite distinct in the Giant Kangaroo, Wallaby, *Phalangista*, Opossum, and *Perameles*.

The gluteus quartus in the Wombat arises from the outer side of the anterior inferior spine of the ilium, external to the origin of the rectus, and is inserted into the front of the great trochanter. In *Sarcophilus* the attachments are similar, and the muscle is very distinct. In the Giant Kangaroo it arises below and in front of the gluteus minimus and behind the rectus femoris, and is inserted below the summit of the great trochanter; it is flat and cleft into two parts in *Macropus Bennettii*, which are nearly equal; it is also present in the Phalanger, but small; it is more distinct in the Opossum.

The pyriformis muscle is a slip separated from the gluteus medius by the gluteal nerve, and arises inside the pelvis from the front of the sacrum, and is inserted into the summit of the trochanter; it is separate in the Wombat and *Sarcophilus*, but not nearly so large proportionally as in *Macropus giganteus*, *ruficollis*, or *Bennettii*; it is small and distinct in the Opossum, but undistinguishable from the gluteus medius in *Phalangista*; it is larger and separable in the Bandicoot (*Perameles lagotis*).

No obturator internus exists in the Wombat or *Sarcophilus*; but a large gemellus inferior is present in both, running from the tuber ischii to the digital fossa within the trochanter. In the *Macropus giganteus* and *Bennettii* the gemelli are also large, and extend into the pelvis, occupying all the space above the tuberosity of the ischium and below the obturator foramen, as far forward as the ascending ramus of the ischium: it is thus a rudimental obturator. This muscle is still smaller in the Phalanger, but more distinct, though small, in the Opossum.

The obturator externus is very large and normal in *Phascolomys* and *Sarcophilus*, as well as in *Macropus giganteus*, the Wallaby, Phalanger, and Opossum. Meckel says there is no obturator internus or gemelli in the Kangaroo, but that they are present in the Opossum.

The quadratus femoris is absent in the Wombat, and present only as a partially differentiated slip of the adductor magnus in *Sarcophilus*; it is large and distinct in the Kangaroos, and

forms a powerful "tie-beam" between the ischium and femur, on which latter is a special tubercle for its reception; it is smaller in the Opossum and Phalanger, and thus seems to be specially developed in those marsupials with disproportional length of the fore and hind limbs.

The iliacus internus, a large muscle, arises in the Wombat and *Sarcophilus* from the entire iliac fossa and anterior margin of the ilium; it is inserted into the ridge below the lesser trochanter. There is no ilio-capsular in either of these marsupials; it is closely attached to the psoas, as is the case also in the *Macropus Bennettii*. Separation is more readily effected in the *Macropus giganteus* and Opossum, but not so freely in the phalanger or *Perameles*.

The psoas parvus in the Wombat is a weak muscle, but has a strong tendon; its origin extends over four vertebræ. It is rather stronger in *Sarcophilus*, but reaches its greatest development in the leaping kangaroos, being more than six times as large as the psoas magnus in the Giant Kangaroo, and twice as large as the psoadiliacus in the Wallaby; it is only one-third as large in the Phalanger, and still smaller in the Opossum. Thus the disproportion is only associated with leaping, and not with the marsupial type of muscles.

The psoas magnus in the Wombat arises from all the lumbar and from the last dorsal vertebræ, and is inserted along with the iliacus. In *Sarcophilus* its origin extends a vertebra higher; in the Giant Kangaroo it is attached to the lower two or three lumbar vertebræ, as is also the case in *Macropus Bennettii* and *Perameles lagotis*.

The coccygeus is small and distinct in both the Wombat and *Sarcophilus*, and is larger in *Macropus giganteus* and the Wallaby.

The rectus femoris is a distinct muscle, as usual, with a single marginal origin from the anterior inferior spine of the ilium, in *Sarcophilus*, Wombat, *Macropus giganteus* and *Bennettii*, *Phalangista vulpina*, and Virginian Opossum. Professor Owen, however, describes this muscle in *Perameles lagotis* as having two origins which are very distinct from each other.

The vastus externus is large in the Wombat, and is with difficulty separated from the vastus internus; it is even less distinct in the *Sarcophilus*, but in the Giant Kangaroo it is readily separable. In the *Macropus Bennettii* its origin receives an accessory fasciculus from the fascial insertion of the gluteus maximus and tensor vaginæ femoris.

The vastus internus in all is smaller than the externus, and can be separated even from the cruræus in *Macropus Ben-*

*nettii*. In *Macropus giganteus* it is, however, inseparable from the cruræus; but in *Phalangista*, *Perameles*, *Didelphys*, *Sarcophilus* and *Phascolomys* it is nearly inseparable from the externus.

The patella is mentioned as absent in the Wombat by Sir E. Home (Phil. Trans. vol. xcviii. 1808, p. 304); in reality it is present, but cartilaginous.

The popliteus in the Wombat and *Sarcophilus* is very large, but thin, arising from the upper third of the back of the fibula and inserted into the lower two-thirds of the back of the tibia, separate from the transverse tibio-fibular muscle to be hereafter described. A few fibres of this muscle in *Sarcophilus* are attached to the sesamoid bone in the outer head of the gastrocnemius. This muscle is smaller in the Giant Kangaroo, but in this and *Macropus Bennettii* its origin is purely sesamoid.

The adductor longus arises, in the Wombat and *Sarcophilus*, from the crest of the pubis, and is inserted into the middle third of the femur. The adductor brevis and magnus are rarely separable in either *Sarcophilus* or Wombat. In the Giant Kangaroo the three are easily separable, as also in the Wallaby. The adductor brevis is scarcely distinguishable from the adductor magnus in the Opossum, and less so in *Phalangista*. These muscles are always separate from the pectineus, internal and posterior to which they lie; the three portions are most distinct in the Opossum.

The pectineus is a small muscle, but double in the Wombat; the inner part passes from the spine of the pubis and marsupial bone to the line leading from the lesser trochanter to the linea aspera; a second portion passes close to the insertion of the psoas and iliacus external to the last. This muscle is similarly double in *Sarcophilus*; it is single in the Giant Kangaroo, Opossum, and Phalanger, small and definite in each. The slip from the marsupial bone exists in all marsupials which have hitherto been dissected.

The semimembranosus is fleshy for its whole extent in the Wombat and *Sarcophilus*, and has its normal course from the tuber ischii to the upper and inner part of the head of the tibia; it is closely in contact with the adductor magnus in the Giant Kangaroo; and in the Wallaby its origin extends farther forward than usual; it is closely connected to the semitendinosus in its origin in the Virginian Opossum, but separate in *Phalangista vulpina* and *Perameles lagotis*.

The semitendinosus in both *Sarcophilus* and the Wombat is normal in its course, quite separate from its neighbours, and

with no tendinous inscription; it is similar in the Phalanger, Opossum, *Perameles*, Giant Kangaroo, and *M. ruficollis*, in none of which is an inscription present. This appearance was carefully searched for in all cases, but I could see no trace of it. (In an Otter dissected by me, Jan. 1870, not only was an inscription well marked, but the muscle above it had two separate origins—one from the caudal vertebræ and the other from the ischium; and these united exactly at the intersection and formed one belly.)

The biceps in *Sarcophilus* arises from the tuber ischii and from the upper four caudal vertebræ beneath the agitator caudæ, and is inserted into the outside of the knee; in its caudal origin and fibular insertion it is similar to that of the agitator caudæ in *Ornithorhynchus*; but in this latter animal a distinct biceps underlies, which has a purely ischiatic origin. The insertion is fibular in *Sarcophilus*; and the muscle is very similar in its position and attachments in *Phascolomys*. In the Wallaby its origin is connected to that of the semitendinosus; its tendon extends down the leg into the fascia over the gastrocnemius.

A fourth hamstring (bicipiti accessorius of Haughton) underlies the biceps in *Sarcophilus*, which stretches from the caudal vertebræ to the fibula and fascia of the leg. This muscle is absent in the Wombat, in the Giant Kangaroo, Bennett's Kangaroo, Phalanger, and Opossum; it is the longest muscle in the body of *Sarcophilus*, as is usually the case in animals in which it exists. Professor Owen describes it as present in the Kangaroo, and mentions that it is inserted with the biceps by two fasciculi into the outer condyle of the femur and the fascia over the gastrocnemius.

The gracilis arises in the Wombat and *Sarcophilus* from the symphysis and descending ramus of the pubis, and is inserted into the inside of the knee-joint; it is a strong muscle; it has an attachment to the marsupial bone in these as in all the other marsupials which I have examined.

The sartorius in the Wombat, *Phalangista*, *Macropus giganteus*, Wallaby, and *Dasyurus macrurus* arises from the anterior superior spine of the ilium, and is inserted into the inner side of the patella. In *Sarcophilus* its origin is extended inward along Poupart's ligament, as in *Bradypus tridactylus*. In *Perameles* it is nearly parallel to the rectus femoris.

The tibialis anticus in the Wombat passes from the outer surface of the tibia to the entocuneiform bone; it is well marked and presents nothing unusual in its appearance in the Virginian Opossum or in the Phalanger. In the Giant Kan-

garoo it is large, and its tendon is inserted into the base of the metatarsal bones of the two inner toes. This segmentation is carried a step farther in *Sarcophilus*, and a portion of the anterior tibial muscle is separated and detaches a weak tendon to the second metatarsal. The tendon from the single muscle-belly goes to the two metatarsals in *Macropus Bennettii*; but the muscle is much smaller proportionally than in the Giant Kangaroo. The tendon is also double in *Perameles lagotis*, and is attached to the middle and inner cuneiform bones.

The extensor digitorum longus arises from the fibula and from the front of the tibia, and is inserted into the four toes in the Wombat and *Sarcophilus*. In the Phalanger and Opossum its tendons are similarly disposed; but in Bennett's and the Giant Kangaroo it is distributed only to the third and fourth toes by distinct tendons.

The extensor brevis digitorum is present in all the marsupials which I have examined, and passes from the outer side of the tarsus to be inserted into the inner pair of toes.

The extensor hallucis in *Sarcophilus* is small and obliquely placed between the tibialis anticus and the extensor digitorum; it is inserted into the inner toe, together with the inner tendon of the short extensor. In the Wallaby it is inserted into the inner pair of toes by fine tendons. In the Phalanger and the Opossum it is also inserted into two toes. The Wombat possesses this muscle; but it is very small, and goes only into one toe.

The gastrocnemius externus in the Wombat, Giant Kangaroo, *Sarcophilus*, and Bennett's Kangaroo arises from the sesamoid bone at the back of the external condyle of the femur, and is inserted into the tendo Achillis and by it into the back of the os calcis. In the Opossum the muscle arises from the outer condyle of the femur.

The gastrocnemius internus is very separate in all from the external muscle; it arises from the inner condyle and joins the tendo Achillis, and is inserted in common with the last; it is larger than the externus in the Wombat, but smaller in *Sarcophilus*. It has no sesamoid bone in any of the species examined.

The soleus has a fibular small origin in the Wombat, but, as usual, has no tibial head. *Sarcophilus* has also a fibular soleus. The same is true in the Opossum and Phalanger, the Wallaby and Giant Kangaroo.

The plantaris in the Opossum and *Perameles* is small, but separate, passing from the outer condyle to the outer side of the heel; but no plantaris exists in the Wombat. A distinct small muscle in *Sarcophilus* passes from the back of the

external lateral ligament and from the head of the fibula, and passes down to the internal side of the calcaneum and into the plantar fascia.

The peronei in *Sarcophilus* are complex: the peroneus longus arises from the upper and anterior parts of the fibula, winds round the outer side of the calcaneum and the cuboid bone to be inserted into the first metatarsal. The peroneus brevis lies anterior to the long muscle, and arises nearly as high up; its insertion is into the metatarsal bone of the little toe. Arising in common with it is the peroneus quinti digiti, which is inserted into the last phalanx of the outer toe. Still further forward are two other peroneal muscles, which arise from the lower four-sevenths of the fibula by a common fleshy belly, and, winding round the back of the outer malleolus, pass forward to be inserted, one into the extensor aponeurosis of the fourth, and one into the third toe. There are thus five peronei present in this animal. In the Giant Kangaroo four peronei are present—a peroneus longus, a peroneus brevis, quinti, and quarti digiti. The same series exists in the Wallaby, Phalanger, and Opossum. In the Wombat the only muscles of this group present are the long and short peronei, with an accessory quinti tendon detached from the last for the first phalanx of the outer toe.

The Monotremes *Ornithorhynchus* and *Echidna* possess three peronei also.

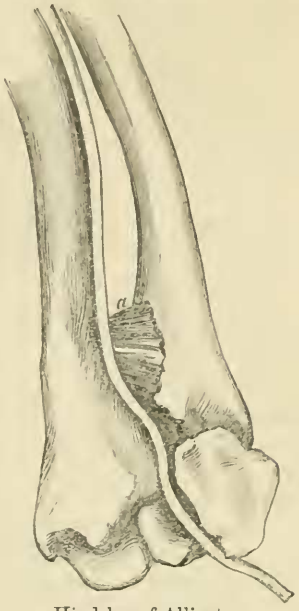
The tibialis posticus arises in the Wombat from the back of the tibia, below the outer side of the head of the bone, and is inserted into the inner side of the scaphoid bone. In *Sarcophilus* it arises from the back of the fibula and tibia, and is similarly attached in the Wallaby and *Macropus major*. In the Opossum and Phalanger it is inserted into the base of the metatarsal bone of the hallux.

The flexor digitorum longus in the Wombat passes from the back of the tibia and fibula, and is in reality a compound of two parts, the flexor digitorum and the flexor hallucis; from the one belly five tendons pass, one to each of the toes. In *Macropus giganteus*, *M. Bennettii*, *Sarcophilus*, the Opossum, and Phalanger these muscles are similarly fused. In the Virginian Opossum a small slip, separate from this muscle and interposed between it and the tibialis posticus, passes to the metatarsal bone of the hallux, which may be a degraded flexor hallucis.

Professor Owen describes in *Dasyurus macrurus* a muscle which arises from the upper half of the back of the fibula, and, passing round the inner malleolus, is inserted into the plantar fascia; this muscle he regards as a degraded plantaris. There

was no muscle corresponding to this in *Sarcophilus* or in any of the other marsupials dissected.

In both the Wombat and *Sarcophilus*, as well as in *Phalangista* and *Perameles*, there exists a transverse tibio-fibular muscle, homotypical with the pronator quadratus, quite separate from the prolonged popliteus, and similar to the transverse muscle of the Alligator, Crocodile, Iguana, and other reptiles: the muscle was described by Professor Owen as an aborted flexor digitorum communis longus; but a careful study of its properties would scarcely confirm this view. When considered in relation to the perineo-calcanean muscle of human anatomy, its position with regard to the quadrate pronator seems to be definite. I append a sketch of this muscle as it exists in the Alligator, which is characteristic of its relationship.




Hind leg of Alligator.
*a*, pronator quadratus.

On the sole of the foot in the Devil and Wombat the following muscles are seen—abductor hallucis, abductor minimi digiti, showing nothing peculiar; and behind the last there lies a small abductor ossis metatarsi minimi digiti, in *Sarcophilus*.

The plantar interossei are three in number, attached respectively to the second, third, and fourth toes, from the corresponding metatarsal bone. The dorsal interossei are abductors of the first, second, and fourth digits, and have double origins.

---

## XVII.—*Descriptions of three new Species of Birds from China.*

By Robert Swinhoe, F.Z.S.

### Family **Rallidæ**.

*Porzana mandarina*, sp. nov.

Crown, hind neck, and upper parts deep brownish olive, ruddy on the forehead. Throat pure white. Eyebrow, the whole face, neck, and breast to the middle of the belly ferru-